CLAIMS

1. A system for detecting a physical, chemical or biochemical reaction comprising:

a coherent radiation source for producing an incident wave;

a carrier surface for supporting a specimen to be analysed, the carrier surface mounted on a substrate and capable of supporting surface electromagnetic waves (SEW);

means for splitting the incident wave into an SEW and a first scattered wave, wherein the SEW propagates along the carrier surface and interacts with the specimen;

means for generating a second scattered wave from the SEW; and,

a detector for monitoring the interference between the first scattered wave and the second scattered wave.

2. A system according to claim 1, wherein the incident wave is a SEW.

3. A system according to claim 1 or 2, wherein the means for splitting the incident wave is a discontinuity in the carrier surface.

4. A system according to any preceding claim, wherein the means for generating the second scattered wave is a discontinuity in the carrier surface.

5. A system according to claim 3 or 4, wherein the discontinuity is a discontinuity in the thickness of the carrier surface.

6. A system according to claim 3 or 4, wherein the discontinuity is a discontinuity in the refractive index of the carrier surface or adjacent materials.

7. A system according to any preceding claim, wherein the specimen is contained in a reaction vessel containing a reaction fluid, and wherein at least one scattered wave propagates through the reaction fluid.

8. A system according to claim 7, wherein the detector is positioned outside the reaction vessel.

9. A system according to claim 8, wherein the reaction vessel is shaped relative to the position of the carrier surface and the position of the detector so as to minimise the effect of fluctuation in the refractive index of the reaction fluid on the interference detected by the detector.

10. A system according to any preceding claim, wherein the SEW is a surface plasmon.

11. A system according to any preceding claim, further comprising a polymerase on the carrier surface suitable for matching complimentary base pairs of a DNA strand, wherein the system is used to monitor a DNA sequencing operation.

12. A system according to any preceding claim, wherein a plurality of areas of the carrier surface can be monitored simultaneously.

13. A system according to any preceding claim, wherein a plurality of areas of the carrier surface can be monitored sequentially.

14. A system according to claim 12 or 13, wherein the carrier surface includes a plurality of structures of different width.

15. A carrier chip for a specimen to be monitored, comprising:

a dielectric substrate; and

a conductive film formed on the surface of the substrate suitable for carrying the specimen;

wherein the conductive film comprises first means for splitting an incident wave into a first scattered wave and a surface electromagnetic wave (SEW), the SEW propagating along the carrier surface and interacting with the specimen, and a second means for generating a second scattered wave from the SEW.

16. A carrier surface according to claim 15, wherein the first and second means are discontinuities in the conductive film.

17. A carrier surface according to claim 16, wherein the first or second means is a discontinuity in the thickness of the conductor film.

18. A carrier surface according to claim 16, wherein the discontinuity is a discontinuity in the refractive index of the carrier surface or adjacent materials.

19. A carrier surface according to any one of claims 15 to 18, further comprising means for generating a reference scattered wave.

20. A carrier surface according to claim 19, wherein the reference scattered wave is generated from an incident wave.

21. A carrier surface according to claim 19 or 20, wherein the reference scattered wave interferes with both the first or second scatted wave at a different spatial frequency from that at which the first and second scattered waves interfere.

22. A carrier surface according to any one of claims 15 to 21, wherein the second means is an increase in the thickness of the film in the direction of propagation of the SEW.

23. A method of monitoring a specimen undergoing a physical, chemical or biochemical reaction occurring on a surface supporting surface electromagnetic waves (SEW), comprising the steps of:

splitting an incident wave into a first scattered wave and SEW such that the SEW propagates along the surface and interacts with the specimen;

splitting the SEW which has interacted with the specimen to generate a second scattered wave; and,

monitoring the interference pattern between the first and second scattered waves.

24. A method according to claim 23wherein the incident wave is a SEW.

25. A method according to claim 23 or 24, wherein the incident wave is generated by a coherent light source.

26. A method according to any one of claims 23 to 25, wherein the specimen is held within a reaction fluid in a reaction vessel, and at least one of the first and second scattered waves propagates through the reaction fluid.

27. A method according to claim 26, wherein the monitoring of the interference pattern takes place outside of the reaction vessel.

28. A method according to claim 27, wherein the reaction vessel is shaped so as to minimise the effect of fluctuations in the refractive index of the reaction fluid on the interference pattern between the first and second scattered waves.

29. A method according to any one of claims 23 to 28, wherein the specimen includes a polymerase, and the SEW interacts with the polymerase as it incorporates nucleotides into a polynucleotide strand complementary to a target polynucleotide.

30. A carrier surface according to any one of claims 15 to 22, together with an immobilised polymerase enzyme fixed to the carrier surface.